

# Electrochromic Windows



## National Labs Make Dynamically Tinting Windows a Reality



Department of Energy (DOE) laboratories are instrumental in the development of new energy-efficient technologies. In fact, if DOE's 17 national labs were not able to marshal their considerable resources on behalf of industry and absorb the risk inherent in early-phase scientific research, many technologies would simply not exist. Electrochromic (EC) windows are one such technology. Decades of research and innovation by Lawrence Berkeley National Laboratory (LBNL) and National Renewable Energy Laboratory (NREL) have made dynamically tinting “smart windows” a global reality. Lab advances in material science have been the catalyst for new EC window technologies, and lab support—from developing innovative window applications to conducting field studies—has enabled those technologies to evolve and deploy commercially. This multi-dimensional approach to scientific inquiry ensures that research finds its way out of the lab and into the marketplace.



### MATERIAL SCIENCE

#### ADVANCES IN MATERIAL SCIENCE CATALYZE INDUSTRY

DOE labs have a long history of leadership in material science research. With an extensive physical and organizational infrastructure, they provide unique multidisciplinary scientific capabilities that are beyond the scope of most academic and commercial institutions. Since the 1980s, national labs have fostered five dynamic glass companies, SAGE Electrochromics and View Dynamic Glass among them.



### ENERGY PERFORMANCE

#### MEASURING PERFORMANCE DEMONSTRATES VALUE

Objective energy performance data encourages the adoption of new building-envelope technologies. DOE labs have conducted extensive laboratory testing and field studies to measure the performance of EC windows. Simulation tools developed by the labs accurately predict performance and help guide designers, specifiers and building owners in selecting EC windows.



### WINDOW APPLICATIONS

#### INNOVATION FOR THE BUILT ENVIRONMENT

Lab researchers have been instrumental in developing practical applications for EC technology. From creating thin films and testing control strategies to developing scalable manufacturing processes and ASTM durability standards—the story of national lab participation in the development of EC windows is the story of innovation.



### HUMAN FACTORS

#### ASSESSING HUMAN FACTORS IN BUILDINGS

Property owners are hesitant to embrace new technologies without knowing how occupants will respond to them. Large-scale DOE lab field studies have demonstrated widespread user acceptance of dynamic windows, encouraging their adoption in everything from office buildings to airports.

# Key Lab Contributions to Electrochromic Technology

A multi-dimensional approach to research enables EC technology to evolve and deploy commercially

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